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A HALF CENTURY OF AMERICAN MEDICINE[1]

By Dr. SIMON FLEXNER

THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

BY a happy coincidence it is just a half-century since I entered the University School of Medicine at Louisville as a student. For fifty years, therefore, I have been an observer of the medical developments taking place in this country, and during much of this time I have also followed the developments going on abroad. It is my purpose on this occasion to attempt a brief and rapid review of American medicine of this period in relation to European medicine as it existed at the same time.

But first I must express to you the happiness I feel in returning here to my Alma Mater and to the city of my birth and young manhood. I am moved to salute you on the celebration of the hundredth anniversary of your foundation, to congratulate you on your past, and to wish you ever greater achievements in the future.

The early history of the Louisville Medical School is an integral part of the history of the American frontier and the winning of the West. Abler and better-informed writers have recorded the beginnings of the school, brought it into relation with Transylvania University, from which the first nucleus of its faculties came, and followed its later vicissitudes. The school was an important link in that historical chain of peripatetic schools which, before the middle of the last century, attracted the experienced physicians and surgeons of the day who wandered up and down the country from east to west, doing their part, and a very significant part, in subduing the wilderness. It is a pleasure and an inspiration to recall some of the remarkable men who taught here, among whom were Daniel Drake, Samuel D. Gross, Austin Flint, Elisha

[1] Address delivered on April 3, 1937, at the celebration of the one hundredth anniversary of the founding of the School of Medicine of the University of Louisville.

Bartlett, Benjamin Silliman, Jr., Charles Caldwell and the elder Yandell and Palmer. These men left an impress on the school which endured long beyond their days. They anticipated the later practice of calling outstanding teachers from one institution to another, too long suspended subsequently when the schools had hardened into fixed institutions, each with its local faculty. Indeed, this innovation waited full half a century until the medical schools of the country progressed sufficiently to achieve real university status.

Fifty years ago the pioneering period in medical education had come to an end. The riding of the circuit by wandering teachers was over. One can picture the glamor of the free life led by these men in their young manhood as they rode without haste through a primeval and often beautiful country, and the thrill and pleasure they experienced in meeting one another again after months or even years of separation. That a warm companionship grew up among them could be safely assumed, and letters of the period tell this story. Elisha Bartlett, one of the rarest and most delightful of men, who taught at the Berkshire Medical Institute in Pittsfield, Mass., as well as in Louisville, wrote in 1836, referring to Willard Parker: "He was in to see me a few minutes after my arrival, with his sunny face and hearty welcome. It does one good to meet such men." Bartlett, by the way, taught in nine schools, as also did another peripatetic, John Delamater, the founder of the Medical College of Western Reserve University. That the peripatetic doctors, when they were men of ability, should have become highly experienced teachers follows from their unexampled opportunities. They enriched, therefore, the medical literature of their time and some of their writings have become the classics of our profession.

The Louisville Medical School in my day still bore the impress of these teachers. It was a school in which the lecture was everything. Within the brief compass of four winter months the whole medical lore was unfolded in discourses following one another in bewildering sequence through a succession of long days; and lest the wisdom imparted should exceed the student's power of retention, the lectures were repeated precisely during a second year, at the end of which graduation with the degree of doctor of medicine was all but automatic. Of laboratory instruction there was none; the anatomical laboratory provided the one place where practical instruction was given, and yet the students managed somehow to become doctors, and ever so often good doctors at that.[2]

The saving grace was the preceptorial system, virtually an apprenticeship, in which older, experienced men taught the methods of their art to the student doctors during the eight months between courses. The apprentice served his master as druggist, operating assistant, and in many other ways; rode with him on his rounds, took his place when he was ill and at times in the blustery nights, and supplemented him when epidemics swept the countryside. That unusual skill should sometimes have crowned so imperfect an educational discipline justifies the comment made by an eminent teacher, Dr. William H. Welch, himself a product of the old order, that "the results were often better than the system." A profession based on so faulty a system of education could not survive in a country developing materially, becoming conscious of its intellectual deficiencies and sensitive to the opinion of the larger world of which it now formed an integral part. That forward steps should originate in the East, longer settled and more prosperous, and that the first step should have been taken at Harvard College need excite no wonder. One of the revolutionary acts set in motion by President Eliot when he took office in 1869 was the regeneration of the Harvard Medical School, which, to all intents and purposes, corresponded to this school as I knew it just twenty years later. President Eliot improved the student body by raising the entrance requirements and the school by prolonging and grading the courses of instruction and by introducing practical methods of clinical teaching and even laboratory training. But the Harvard school, like all the other schools of the period, lived on students' fees. By raising the standards, giving the school a real university status, and by arousing public interest in the reforms undertaken, President Eliot soon secured aid from the citizens, justifying his dictum that "the first step toward obtaining an endowment is to deserve it."

The decade from 1870 to 1880 is a highly significant one in the medical educational history of this country. It was a preparatory period, the full effects of which were to be realized a few years later. The first ventures in medical instruction made in colonial times were sound. They were based by John Morgan and his associates in Philadelphia on the Scotch system, and the rules laid down by them as qualifications for the "bachelor's degree in physic" arouse admiration even to-day; they include some knowledge of the Latin tongue and such branches of mathematics and natural and experimental philosophy as shall be judged requisite to a medical education. A hundred years were to elapse before a corresponding standard of educational

[2] In my day there was no pathology and of course no bacteriology at the Medical School. In 1889 Dr. Edward R. Palmer, the professor of physiology, announced a course of lectures in bacteriology. They consisted of readings from a fascinating small book, Prudden's "Story of the Bacteria," which had just appeared. I present this book in its first edition to your view. Need I add that I bought the book to read instead of attending lectures in order to hear it read in weekly instalments. This was doubtless the beginning of bacteriology in the school.

preparation for the study of medicine was again instituted.

The modern developments in American medicine are of German origin. The Scotch, English and French schools had attracted ambitious American students in the eighteenth and early part of the nineteenth centuries. The rise of the German medical schools to pre-eminence began with the appearance on the scene of two remarkable teachers, near contemporaries. One was Johannes Müller, born in 1801, and the other Justus von Liebig, born in 1803. Müller, the son of a shoemaker of Coblentz, was anatomist, physiologist and pathologist. He studied at Bonn and at Berlin and became professor in both these universities, and was the teacher of great men, among whom were Schwann, the founder of the cell theory, Henle, the anatomist who formulated precisely in 1840 the germ doctrine of disease, Traube, the experimental pathologist, Helmholtz, the physicist and physiologist, and Virchow, the originator of the cell doctrine in and the father of modern pathology. Liebig's father dealt in colors and with the aid of his small son manufactured them by the elementary methods of the day. Chemistry thus came naturally to the youth who was to establish the student's laboratory, a decisive factor in making German science, including medical science, supreme. As early as 1824, Purkinje, the physiologist, started a laboratory in his own house in Breslau, but it was in Giessen in 1825 that the important step was taken when Liebig's laboratory was opened there in the university. It is interesting to recall that it was Alexander von Humboldt, the insatiable traveler, who was responsible for this great innovation. The gifted young Liebig, in 1822 at the age of nineteen, studied in Paris. At that time there did not exist in Paris, or indeed anywhere in the world, a single public laboratory for students in chemistry or physics. Through private influence Liebig secured entrance to the personal laboratory of Gaultier de Claubry, where he worked on explosives and by chance met Humboldt, who was deeply impressed by him. Thereafter all doors and all laboratories opened to him as if by magic, and he was soon at work with the eminent Gay-Lussac; and it was Humboldt also who brought Liebig to the little University of Giessen.

Liebig's chemical laboratory quickly became celebrated and copied by the German universities generally and in other countries. The first two men who devoted themselves entirely to laboratory teaching in this country in a medical subject were Henry P. Bowditch at the Harvard Medical School and Newell Martin at the Johns Hopkins University. This was in the years from 1870 to 1876. Both had studied abroad, Bowditch at Leipzig with Karl Ludwig and Martin at Cambridge with Michael Foster, the founder of the English school of physiology. There had, however, been a full-time teacher at the Harvard Medical School before Bowditch. Oliver Wendell Holmes taught anatomy and physiology there from 1847 to 1871, holding, as he later said, "not a chair, but a settee."

In the decades from 1860 to 1890 pathology in Germany reached its height under the stimulus given it first by Virchow and then by Cohnheim. Pathological anatomy was everywhere assiduously pursued, but it was at Berlin under Virchow and the clinical teacher Traube that pathological experiment was placed in its impregnable position in the development of pathological physiology. But in the seventies another school of great strength in experimental or physiological pathology arose at Breslau under Cohnheim, a pupil of Virchow's who also was a pupil of the physiologist and chemist Kühne of Heidelberg. These two centers—Berlin and Breslau—vied with the new German university at Strassburg in attracting American students, and hither in the middle seventies went such men, afterwards to become teachers and investigators in pathology, as William H. Welch and T. Mitchell Prudden.

They returned to this country before 1880 and neither of them found an opportunity to teach pathology in an adequate way. Hence they engaged in a variety of pursuits to gain a livelihood—practicing medicine, performing autopsies, quizzing medical students, doing a kind of hack literary work, with only odds and ends of time left for practicing their chosen profession.

But great changes were imminent. A small beginning was soon made at Bellevue Hospital in New York, where Dr. Welch offered the first course in microscopical pathology given in America and where he met Austin Flint, who was not long in discovering his unusual abilities. I like to connect these important events with the history of the Louisville Medical School, at which Austin Flint taught in pioneer days. It is a fact of history that Welch wrote the pathology for the fifth and sixth editions of Flint's "Practice of Medicine" and in so doing produced one of the first treatises on pathology worthy of the name in this country. The sections on pathology in the sixth edition have not, in my opinion, been surpassed in any language and they are unique in the breadth of treatment given them. This edition was published in 1886, or in the midst of the Koch or bacteriological period, so that it covers not only pathology in the usual sense, but also pathological physiology reflecting the Cohnheim influence and embodies the principles of the new bacteriology. Prudden started in practice in New Haven, but in 1878 was called to the College of Physicians and Surgeons in New York, where he opened the first

pathological laboratory in that school in a basement room which had been an ice-cream parlor. It was not until 1884 that Welch was called to Baltimore and not until 1892 that Councilman, who had studied with Cohnheim in 1883, was called to Harvard Medical School to fill the chair of pathology, the first professorship in this institution to be filled from outside Boston.

More important, however, for the impending developments was the founding of the Johns Hopkins University and Hospital. Mr. Hopkins, a Baltimore merchant, left his entire fortune of seven million dollars to the support of the university and the hospital. Daniel C. Gilman was made president of the university. A medical school, part of the university and attached to the hospital, was in contemplation. The university opened in 1876, and Thomas H. Huxley delivered the inaugural address, in the course of which he said:

> At present young men come to the medical schools without a conception of even the elements of science. They learn for the first time that there are such sciences as physics and chemistry and physiology and are introduced to anatomy as a new thing. . . . There is not the least reason why this should be so. . . . There is not the slightest difficulty in giving sound elementary instruction in physics and chemistry and the elements of physiology in the ordinary schools. . . .

These fateful words fell on prepared soil. President Gilman had graduated from the Sheffield Scientific School of Yale College and in 1870 was instrumental in arranging there a premedical course in the physical sciences. It was natural, therefore, that such a course should be offered immediately at the Johns Hopkins University; moreover, it was supplemented with courses in modern languages. Prudden had been a student at the Sheffield Scientific School in the early seventies and had taken, as part of his regular instruction, this preliminary medical training, and Welch, having graduated from the arts college, returned after a year of school teaching to spend an extra year at the Sheffield School before entering on the study of medicine at the College of Physicians and Surgeons in New York.

The decade 1880 to 1890 has been called "the most wonderful, perhaps, in the history of medicine." Pasteur's famous labors were drawing to a close with the dramatic demonstration in 1885 on the Alsatian lad, Joseph Meister, that he had perfected a means of preventing rabies or hydrophobia. Koch and his pupils had discovered the germ causes of tuberculosis, Asiatic cholera, diphtheria, typhoid fever and other infectious diseases. A revolution in medical thought had been brought about by the discoveries of this epoch, and those living to-day can hardly realize the enthusiasm and youthful spirits which were stirred by these advances not only among medical men but among the public.

The eastern medical schools and the University of Michigan had responded to these influences. The most significant advance had been made at the Johns Hopkins University, to which Dr. Welch, a pupil of von Recklinghausen, Ludwig and Cohnheim, was called as professor of pathology.[3] The Johns Hopkins Hospital opened its doors to patients in 1889, the entire major clinical staff having come from outside Baltimore. The names of these men—Osler, Halsted, Kelly—have become household words among doctors. This was an innovation indeed. For the first time in educational history in this country a medical faculty had been chosen on strictly university lines.

Untoward circumstances delayed the opening of the medical school for another five years. When it was established the laboratory faculty was chosen on the same broad principles of scientific attainments. Moreover, the requirements for entrance on medical studies adopted were essentially those laid down in Professor Huxley's address, and the school avowedly accepted the thesis that its responsibility for the instruction of students and the training of doctors was no greater than its responsibility for the advancement of knowledge by research.

By the end of the nineteenth century several medical colleges were equipped with laboratories manned by specially trained teachers and had secured larger clinical facilities; and at the beginning of the twentieth century the pursuit of science, including medical science, had been given a great impetus in this country through the intelligent action of certain laymen. The Rockefeller Institute for Medical Research was founded in 1901 and the Carnegie Institution of Washington in 1902.

Now there is nothing peculiar about the medical sciences. They are only biology, chemistry and physics directed toward particular ends, namely, the understanding of disease and its prevention and cure. The successful prosecution of medical research depends, therefore, on knowledge of the underlying sciences. Medicine had progressed so far in America because

[3] Pathology had a development in America differing from its German prototype. It included normal as well as pathological microscopy (histology), bacteriology during the Koch era, experimental medicine or pathological physiology, and sometimes even clinical microscopy. The several subjects included ranged about the microscope, which was used in all. Whether pathological physiology became a part of the chair depended on the particular master with whom the occupant had studied in Germany. It was not until academic or full-time clinical chairs were established at the Hospital of the Rockefeller Institute in 1910 and at the Johns Hopkins Medical School in 1914 that experimental medicine was studied in the clinic as Ludwig Traube had done in Berlin before 1850.

the fundamental sciences fortunately had already been cultivated, although inadequately. According to ordinary perceptions it was little hazardous to found an institution for pure research in the physical sciences and extremely adventurous to attempt to do this for medicine. I doubt whether any medical man would have made this venture. To do so called for the courage of laymen who managed somehow to see the wood unobstructed by the trees. Let us recall that the bacteriological era from 1880 to 1890 had been succeeded by the immunological decade of 1890 to 1900, which saw diphtheria and tetanus or lockjaw robbed of their main terrors by antitoxin and typhoid fever prevented by inoculation. The times were stirring ones and hope for the eventual and not too long deferred conquest of the germ-caused diseases ran high.

The higher medical education already achieved in the last quarter of the nineteenth century, although not yet on a country-wide basis, made possible the experiment about to be undertaken with an institution devoted wholly to medical research. In retrospect a parallel can now be discerned between the establishment of the Rockefeller Institute and the Carnegie Institution in this country and the founding of the learned societies—the Academy of Sciences in France and the Royal Society in England—in the seventeenth century. In both instances the demands of scientific growth and exploration had outgrown the provisions in the universities. A broader base of operations was necessary; the encroachments upon the time of teachers by enlarging routine duties had become menacing; the requirements in elaborate and expensive apparatus had often exceeded the abilities of the universities to supply the needs. The new institutions, which in time came to be generously endowed, filled the gap, and they are justifying themselves as the country's opportunities enlarge more and more, by drawing able men from the universities, enhancing their training and often returning them to the universities increased in power, skill and value.[4]

In the early part of the twentieth century many medical schools were still far behind the advancement which had taken place in some of the more favorably situated institutions. Two logical developments now took place. The Council on Medical Education of the American Medical Association and the Association of American Medical Colleges entered the field shortly before 1910 and succeeded in leading professional opinion on medical standards and, by exerting a kind of moral pressure, brought about much-needed reforms in the backward schools. A second factor was the Carnegie Foundation report on medical education issued in 1910. This report, which many of you will recall, was prepared by my brother, Abraham Flexner, and speaking of it in his Harvey Lecture of 1915, Dr. Welch states: "I consider it to be one of the most remarkable and influential publications in educational literature. It has had not only a large influence upon professional opinion, but especially a large influence on the universities and on public opinion. It is to be characterized as one of the important factors which indicate this remarkable advance in medical education."

Philanthropic organizations now entered on the liberal support of medicine. The General Education Board and the Rockefeller Foundation especially contributed large sums to the further strengthening of the existing stronger schools, the regeneration of others and the establishment of new schools at strategic geographic locations; and the general public responded also, so that in an incredibly short space of time a vast improvement in the medical schools in all parts of the country took place. President Eliot's remark that "the first step toward obtaining an endowment is to deserve it" had been shown to be more than ever true.

The rewarding nature of endowments to advance medical education and research has been shown in many concrete instances; and one could scarcely cite a more impressive example of the power of modern medicine to abate anxiety and to remove the danger of disastrous epidemics than your own recent experience in the confused days of the flood calamity by the application of bacteriological methods of the prevention of disease.

The laboratory branches of anatomy, physiology, pharmacology and biochemistry were well advanced in this country before the end of the second decade of this century. Many more of the medical schools had established laboratories for teaching and for research in charge of trained teachers. Hospitals had been improved and clinical instruction made more effective. But at its best the clinic lagged behind the laboratory and usually was in charge of local practitioners engrossed with practice. Selection according to special qualifications, as was now customary with the laboratory, was highly exceptional. It was not until 1912 that a clinical professorial chair at Harvard Medical School was filled from the outside. Finances had much to do with this defect, but there were and still are other difficulties not yet overcome.

The clinical side of medical education is the central

[4] Germany, from which ambitious young American doctors drew inspiration and training between 1870 and 1900, turned to the United States for the model of its institution of scientific research established at the end of the first decade of the twentieth century. The Kaiser Wilhelm Institute, with its 30 different laboratories, which has just celebrated its twenty-fifth anniversary, is avowedly modeled on the Rockefeller Institute and the Carnegie Institution, founded ten years earlier.

feature toward which the training in the laboratory branches aims. This is not to say that the laboratory subjects have not an interest and scientific purpose of their own. Far less had been done to make the clinic branches strong and effective than had been done for the laboratory subjects. Moreover, the load of responsibilities on the clinical teacher is far heavier than on the laboratory teacher. A head of a principal clinical department is responsible for the patients, for the teaching and in theory for the stimulation of research, while he is also engaged in the onerous and absorbing practice of medicine. The burden is heavier than any one can bear in the modern medical school, where teaching and research and the care of patients in the hospital now involve the many methods of precision which are constantly increasing in number and complexity.

The recognition of the difficulties just alluded to led the Johns Hopkins Medical School in 1914 to a courageous move. Through financial aid provided by the General Education Board, chairs of academic, sometimes called full-time, instruction were established in medicine, surgery, obstetrics and pediatrics. Several other schools have now found the means to institute similar academic professorships. The precise form taken by these new establishments varies somewhat, as is desirable in order to determine what is the most successful and practicable system. The academic teachers are distinguished from the usual clinical teachers mainly through the command of their time for more intensive study of clinical problems arising in connection with patients and for the conduct of laboratory investigations bearing on problems in clinical medicine. No school has tried to or can or should dispense with part-time clinical teachers, who continue to carry as they always have done an important and substantial part of the instruction of students.[5]

The academic clinical professorship is an American invention, but it is attracting the attention and the study of foreign universities. Only a short time ago Oxford University received a gift of ten million dollars for the purpose of endowing these professorships in medicine and surgery.

Up to the last decade of the nineteenth century no scientific medical journal existed in this country. This fact alone speaks for the state of medical science in America forty years ago. The *Journal of Experimental Medicine* was founded in 1896, with Dr. William H. Welch as editor. There was much doubt expressed whether there were enough technically scientific papers being produced to keep the journal alive. No limit was set as to the kinds of scientific papers acceptable; the only exclusion contemplated was that of the practical, clinical paper for which other means of publication already existed. As experience quickly proved, the potential scientific medical richness of the country had been underestimated. In a very few years, the *American Journal of Physiology* was started, and then successively followed journals devoted to pharmacology and therapeutics, infectious diseases, biochemistry, bacteriology, immunology, etc. I have examined the Quarterly Cumulative Index Medicus, and have marked more than thirty journals of technical scientific medical character now being published in this country. The first medical periodical to be published in America was the *Medical Repository,* started in 1797. Just a hundred years were to elapse between the publication of this clinical journal and that of the first scientific journal in this country.

Medicine to most of us means human disease. The definition is a narrow and insufficient one, as all living things suffer from disease. There is no line of division between disease in man and in the lower animals and in plants. Disease in man has of course a special importance for us, just as, economically considered, certain diseases of animals and plants have a higher value than others since man is so dependent on animals and plants for his survival and comforts. But to the true pathologist disease, wherever it appears, presents a series of challenging problems, the solution of any one of which will aid in the solution of others. The pathologist looks at the diseases of man, the lower animals and plants as forming an inseparable chain, and as the knowledge of the nature and causes of diseases continues to grow, this chain becomes more and more intricate and interrelated. The growth of medical knowledge and the improvements in medical education in this country in the last half century have influenced federal and state governments in providing schools in which the diseases of animals and plants can be investigated as human diseases are studied. As early as 1884 the federal government established the Bureau of Animal Industry and in 1887 the enactment of the Hatch act created the agricultural experiment stations. It was at the Bureau of Animal Industry that Dr. Theobald Smith, a medical graduate, made some of his most important discoveries, and although they related to diseases of animals, they affected in a remarkable and beneficent manner the development of human pathology.

The centennial of the founding of the Army Medical Library was celebrated a few months ago. The history of that library is bound up with the history of American medicine in the last half century in a highly important way. Scientific knowledge including medical knowledge is contributed to by all countries; a great library is essential, therefore, to the growth of

[5] This is not to say that clinical teachers did not in some instances conduct experimental investigations before this change. Halsted and his pupils are a notable case in point.

the scientific spirit. Now the Army Medical Library is supreme among medical libraries of the world, and a part of this supremacy arises from the publication of the Index Catalogue, four series of which have appeared between 1880 and 1936. This catalogue is one of the most monumental if not the most monumental bibliographical work ever produced. The history of the library has been told recently by Major Hume, the librarian. In this very interesting paper he reports a conversation with Dr. Welch, who was a regular user of the library, which bears on our theme and which I grasp eagerly in bringing this address to a close. In response to an inquiry, Dr. Welch said:

> I have been asked on more than one occasion what have been the really great contributions of this country to medical knowledge. I have given the subject some thought and think that four should be named:
>
> (1) The discovery of anesthesia;
>
> (2) The discovery of insect transmission of disease;
>
> (3) The development of the modern public health laboratory . . .
>
> (4) The Army Medical Library and its Index Catalogue.

The discovery of anesthesia falls outside the period we are considering. Theobald Smith discovered the tick transmission of Texas fever of cattle at the Bureau of Animal Industry in 1890, and in so doing opened one of the most important chapters in modern pathology. We need only think of the mosquito carriage of malaria and yellow fever to appreciate the tremendous significance of the discovery. And virus and still other diseases of animals and plants also are carried by insect agents.[6]

The development of the public health laboratory had its beginning in 1887, or just fifty years ago, at the Federal Marine Hospital on Staten Island, being transferred to Washington in 1891. The appearance of cholera in New York Harbor in 1892 led to the opening of the first municipal laboratory, and between 1890 and 1894 the diphtheria diagnostic and antitoxin and the tuberculosis diagnostic laboratory was established in New York City under Dr. Hermann M. Biggs and Dr. William H. Park. From these modest beginnings public health laboratories, an essential adjunct to public health administration, have spread over the entire country, being supported by state, county and city funds. The campaign to eradicate the hookworm disease, financed by Mr. Rockefeller in 1910, gave a great impetus to the founding and improving of such laboratories in the southern states.

To these four great American contributions to medicine made during the last half-century I would add a fifth which is so new and indeed so startling that we can only begin to speculate on its importance. It has arisen out of the application of methods, some only just perfected, to the study of the agents causing the infectious diseases. The first advance I shall refer to is the discovery that the specific properties of disease-producing bacteria are of chemical origin. The active chemicals are crystalline in nature and the germs deprived of them become harmless. They take part not only in producing disease, but also in producing immunity from disease.

The second advance is as remarkable, but in an entirely different way. It relates to the viruses, those invisible, elusive, disease-producing agents of which one hears so much to-day. In number they exceed apparently the disease-producing bacteria, and like the latter are responsible for destructive diseases in all orders of living things. As an illustration of the interrelation of disease in man, animals and plants, I may remark that our knowledge of the viruses began with a plant disease—mosaic of tobacco—in which they were first discovered in 1892–93; the next virus disease discovered was foot and mouth disease of cattle, which occurred in 1897; and the first human virus disease to be recognized was yellow fever in 1901. Now, we have learned that infantile paralysis, or poliomyelitis, belongs in this category.

The viruses, as they occur in nature, are revealed to us only as they produce disease. That is, we know them not as such, but through their effects. As this proposition is first stated, it is rather disquieting and one may wonder whether such indirect knowledge is in the true sense knowledge at all. A similar and no longer disquieting case is that of the atom and the still smaller electron, which also are known only through their effects. No one imagines the atom to be a living thing, but pathologists are deeply concerned with the question of whether the invisible viruses are or are not living entities. Can all the phenomena of life—assimilation, respiration, multiplication—go on in such minute particles of matter? The question is still unsettled; but what has recently been found is that some viruses are definite chemicals; for example, the virus of tobacco mosaic disease which has been obtained in crystal form. And as the solution of one such major problem always raises others, we are now confronted with the question of the possibility of inanimate matter multiplying enormously in the body.

[6] There must be persons in this audience who can recall as I can the periodic outbreaks of yellow fever in our southern states. The demonstration of the mosquito carriage of the disease by Major Reed and his small group of volunteers by experiments made on themselves has put an end to those disasters. A quarter of a century later Adrian Stokes laid down his life in Nigeria, Africa, in showing that the monkey can be given yellow fever. Since then knowledge of the disease has grown rapidly. One of the great practical gains has been a method of protective inoculation. The perils of a journey to epidemic places in South America and Africa have now been removed and yellow fever is to be classed among the preventable diseases.

An infinitesimal amount of crystalline mosaic virus introduced into a tobacco plant increases greatly. But we may well leave that problem for the present, feeling that its solution will come in good time.

The viruses differ among themselves in size as measured by physical-chemical methods, and in stability—some are so delicate that they do not withstand chemical reagents. But the invention of the vacuum ultracentrifuge is making the investigation of the nature of these labile viruses possible. These centrifuges are capable of amazingly high speeds which yield a pull as great as 300,000 times gravity. Hence excessively minute bodies can now be aggregated so as to be brought under physical biological study. And by means of the x-ray photographic device, even their structure may be defined.[7]

I seem to have wandered far afield in closing this sketch of the medicine of America of the past half-century. In reality I have not strayed at all. These new discoveries are American in origin and they relate directly to medicine. Moreover, they illustrate in a particularly enlightening manner the interdependence of the physical and the medical sciences. I have already said that there is nothing peculiar about medical science, that it is only biology, physics and chemistry applied to a particular end. In these final examples there is nothing but physics and chemistry used to elucidate problems in comparative pathology—that is, the pathology of all living things. And pathology is merely the basic subject of how disease comes about—how it is initiated in the first instance, through what changes in structure function is impaired, and then finally through what retrogressive alteration health is restored. Just as anatomy and physiology together show us the relation of structure and functions in the normal body, pathological anatomy and pathological physiology or experimental medicine together show us the related altered structure and function in the diseased body. As these subjects come to be better understood, the diagnosis and treatment as well as the prevention of disease will become more scientific and successful.

We have followed some of the developments which in the space of half a century have raised American medicine from a low state to a leading position in world medicine. There is nothing accidental in this great change. What we are witnessing is merely the continuation of the movement westward which has marked the diffusion of knowledge since the revival of learning in the fifteenth century.

"We are like dwarfs," said Bernard of Chartres in the twelfth century, "seated on the shoulders of giants. We see more things than the ancients and things more distant; but it is neither due to the sharpness of our sight nor the greatness of our stature; it is simply because they have lent us their own."

[7] Method has always had a determining influence on experimental science. With every important advance in methods, new discoveries have been made or old ones perfected. Modern medicine owes a great debt to the physical sciences for the new and improved methods they have introduced. But it has the merit of having advanced itself by the discovery of methods applicable in the clinic and in the laboratory through which the diagnosis and treatment of disease have been enhanced.

SCIENTIFIC EVENTS

THE POLAR EXPEDITION OF THE U.S.S.R.

THE daily press reports that a Soviet airplane made a successful landing at the North Pole on May 21, and established a permanent weather and scientific station as the first step in the plan for regular air communication between Russia and America by way of the polar region.

The expedition is in charge of Dr. Otto J. Schmidt, professor of mathematics at the University of Moscow, director of the Soviet Arctic Institute and head of the Northern Sea Route Administration. The flight was made from Rudolph Island, about 82 degrees north and 60 east (or about 560 miles from the Pole). A. V. Vodopyanov was pilot of the plane.

The radio message sent to the U.S.S.R. government at Moscow follows:

We send you, through the Dickson Island radio station, greetings from the North Pole.

Aboard the Soviet plane, *USSR N-170*, we crossed the pole at 11:10 Friday morning. In order to obtain the best results we passed a little beyond the pole seeking a landing field.

We first crossed the pole at 1,750 meters and then came down to 250 meters through the clouds, seeking a place to land. At 11:35 A.M. we landed.

We are sorry to report that difficulty with the radio apparatus delayed our reports to you.

We are about twenty kilometers beyond the pole and a little to the west of the Rudolf Island meridian. We are on an ice floe, but it is possible to bring other planes here to establish a polar station.

Our regards to the government and the party.

Four men plan to remain at the station for about a year. They are Ivan Papanin, who will be in charge; Ernest Krenkel, radio operator; Pyotr Shirsov, hydrobiologist, and Eugene Federov, magnetologist. They will use a carefully planned folding house about 15 feet long by 9 feet wide, and 6½ feet high, which has been elaborately insulated. It weighs only 353 pounds and, in case the ice shows signs of breaking, it can be moved to a new site without dismantling.

SCIENTIFIC EXHIBITS AT THE ROYAL SOCIETY CONVERSAZIONE

The British Medical Journal gives an account of the scientific exhibits shown at Burlington House at the conversazione of the Royal Society on May 4. It states that among historical exhibits were the royal charters of the society, with the charter-book containing the signatures of the founder, patrons and fellows from 1662 to the present day. There were also shown original manuscripts and manuscript letters of early fellows, including Boyle, Hooke, Leeuwenhoek, Leibnitz, Malpighi and Newton. Another exhibit consisted of diplomas and other original documents of William Hyde Wollaston, a recent gift to the society from the Wollaston family. There was also exhibited an unrecorded watercolor portrait of John Dalton; this was shown under the zograscope, a contemporary optical instrument used for domestic entertainment in the eighteenth century. A number of exhibits related to investigations on plants, especially on virus infections. Imperial Chemical Industries has been experimenting on plant hormones. Substances have been isolated from plants and shown to possess growth-promoting properties, and some of the effects of heteroauxin on plant tissues were demonstrated. There were cameras for television, microscopes for ultra-violet light, and an instrument for the photographic recording of transient phenomena, such as lightning surges, with which records could be obtained of phenomena lasting only one or two millionths of a second.

Professor H. H. Woollard exhibited x-ray films illustrating the lymphatics of the human body after injection with thorotrast and barium. Some of this work with thorotrast is described in the recent annual report of the British Empire Cancer Campaign. Another demonstration was of a subjective photometer by Dr. W. D. Wright. This instrument has been used to measure the adaptation functions of normal eyes, and it is hoped to extend the measurements to test the effect of various pathological conditions on the adaptation process.

An unusually large number of exhibits of biological and zoological interest were on view. These included an exhibit showing tails of birds of paradise, bringing out their variations, and a collection of spiny mammals—echidnas of the Australian region and the more familiar hedgehogs and porcupines. Both were from the Natural History Museum.

During the evening a short lecture was given by Professor Andrade on events and personalities in the history of the Royal Society and the vicissitudes of its fellowship in days gone by.

THE CHESAPEAKE BIOLOGICAL LABORATORY

THE Chesapeake Biological Laboratory is situated on the picturesque and interesting Solomons Island at the mouth of the Patuxent River, facing the celebrated Drum Point Harbor, in the very center of the Chesapeake Bay region. It is about 90 miles from the ocean and about the same distance from the fresh waters at the head of the bay. Some ten miles distant across the bay lie the shallow and placid tidewater estuaries of the Eastern Shore, famous for their extensive blue-crab and oyster fisheries. Located in this section is the laboratory's one-thousand acre Aquicultural Experiment Farm. Fresh-water streams flowing into the Patuxent, as well as ponds, offer ample opportunity for the study of fresh-water biology, and near-by along the bay are outcroppings of rich Calvertian fossil beds.

The laboratory first began to take form in 1919, and the present building was built in 1931. A new dormitory has just been completed. On a recently completed 760-foot pier there is a tidal station operated in cooperation with the United States Coast and Geodetic Survey. A large boat, a small power boat and small boats and canoes are at the service of the laboratory. The laboratory is a cooperative organization, the cooperating institutions being the Carnegie Institution of Washington, Goucher College, Johns Hopkins University, the University of Maryland, Washington College, Western Maryland College and the Maryland Conservation Department. It is open from June to August, inclusive, class work beginning on June 23 and ending on August 4.

The laboratory maintains a staff of three on full time, the cooperating institutions supplying the remainder of the personnel and paying their expenses. The problems of special interest to the members of the staff during the present season are: the hydrography of the Patuxent area (Dr. C. L. Newcombe, University of Maryland); the biology of the striped bass and shad (Dr. V. D. Vladykov, Maryland Conservation Department); the algae of the Solomons Island region (Dr. H. C. Bold, Vanderbilt University, working under the auspices of Western Maryland College); the migration and distribution of the blue-crab (Dr. R. V. Truitt, University of Maryland); the diatoms of the Atlantic coast (Mr. Paul S. Conger, Carnegie Institution of Washington); studies on the life history of the blue-crab (Mr. Roy Robertson, Western Maryland College); the biology of *Cliona celata* (Dr. M. C. Old, Ursinus College, working under the auspices of Johns Hopkins University); methods for water analysis (Dr. R. P. Cowles and Dr. Bramble, Johns Hopkins University); strobilization and polymorphism in *Dactylometra quinquecirrha* (Mr. Littleford, University of Maryland); food analyses of the striped bass (Mr. Edgar Hollis, Western Maryland College); physical, chemical and biological fitness of Gun Powder Falls watershed as a brook trout environment (Mr. Fred Seiling, Univer-

sity of Maryland); age and rate of growth of the striped bass in Chesapeake Bay (Mr. David Wallace, Maryland Conservation Department); and certain physico-chemical toleration points in oyster germ cells and larvae (Drs. R. V. Truitt and C. L. Newcombe, University of Maryland).

In addition to work on these special problems a biological survey of the Solomons Island region is being conducted at the laboratory. This survey is comprehensive in outline and is planned as a project of several years' duration. All members of the staff assist, as their time permits, in the work of collecting, preserving and classifying the biological material. This offers an excellent opportunity for advanced students, instructors and specialists in biological subjects to engage in field work and make observations on living things in their natural surroundings.

For the coming season courses are offered in the various significant modifications, structure, habits and classification of the invertebrates; algae; economic zoology; diatoms; ichthyology; experimental zoology, especially the influence of temperature, salinity and certain other factors on behavior, growth and reproduction, special attention being paid to mollusks, crustaceans, polychaetes and coelenterates; and in various biological problems.

The director of the Chesapeake Biological Laboratory is Professor R. V. Truitt, of the University of Maryland, College Park, Md.

AUSTIN H. CLARK

SYMPOSIUM AT THE DENVER MEETING ON THE CONTROL OF DRIFTING SOILS

THE general symposium arranged for the Denver meeting under joint auspices of the American Association and the Ecological Society of America deals with the important problem of "The Scientific Aspects of the Control of Drifting Soils." The program last year on the scientific aspects of flood control was very successful and this year's topic follows naturally in a region where wind erosion is of outstanding importance. Three speakers have been invited to discuss the geological, the biological and the present human phases of the question.

"The Geological Aspects of the Drifting of Soils" will be the topic of the first paper by Dr. M. M. Leighton, chief of the Illinois State Geological Survey. He will consider the nature, importance and examples of the geological factors involved and the cardinal principles to be learned from the geological record.

"Climatic Cycles and Human Populations" is the subject announced by Dr. F. E. Clements, of the Division of Plant Biology of the Carnegie Institution of Washington. He will discuss shortgrass and climate, plant cover in relation to erosion and flood and cooperation as an ecological process.

The final paper by H. H. Bennett, chief of the U. S. Soil Conservation Service, is entitled "Emergency and Permanent Scientific Control of Wind Erosion." He plans to discuss the precise nature of the human problem and the factors involved in wind erosion with especial reference to emergency control *vs.* permanent control.

Each of the papers will be illustrated by demonstrations, lantern slides or other special means.

The symposium will be held at two o'clock on Thursday afternoon, June 24, in the lecture hall of the Trinity Building near the association headquarters. The general plan of the program and arrangements with speakers have been made primarily by Dr. H. de Forest, representing the Ecological Society of America. The sections of the association and affiliated societies meeting in Denver have arranged their special programs so far as possible to avoid conflicts with the symposium in order to permit all members to attend this discussion of a problem of great social importance at the present time.

HENRY B. WARD

AWARDS OF THE LALOR FOUNDATION

THE Lalor Foundation, organized in 1935 for the advancement of scientific research, has issued a statement announcing the recipients of its awards for the academic year 1937–38. These are the first grants made by the foundation and comprise four fellowship awards of $2,500 each for research in chemistry. Seventy-eight applications were received from 70 men and 8 women. They were reviewed by an advisory committee composed of the following scientific men:

Dr. Roger Adams, chairman of the department of chemistry, University of Illinois.

Dr. Katharine Blunt, president of the Connecticut College for Women.

Dr. Harrison E. Howe, editor of *Industrial and Engineering Chemistry*.

Dr. Henry G. Knight, chief of the Bureau of Chemistry and Soils, U. S. Department of Agriculture.

Dr. Charles A. Kraus, chairman of the department of chemistry, Brown University.

Dr. Arthur B. Lamb, professor of chemistry, Harvard University.

The appointments are as follows:

James English, Jr., Ph.D., Yale University, research assistant at the California Institute of Technology, to continue research at the institute on the isolation and constitution of certain hormones promoting plant growth.

Leland John Haworth, Ph.D., University of Wisconsin, instructor of physics at the university, to work in the Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology on the magnetic properties of materials at very low temperatures.

Philip Albert Leighton, Ph.D., Harvard University, asso-

ciate professor of physical chemistry at Stanford University, on leave of absence to conduct research in England and at Harvard University on the properties of free atoms and radicals produced during chemical and photochemical reactions.

Earl Albert Long, Ph.D., Ohio State University, instructor in chemistry at the University of California, to conduct research at the University of California on the properties of radioactive sodium and radioactive phosphorus.

Two additional candidates were recommended for awards, namely, Dr. Eric G. Ball, associate professor of physiological chemistry at the Johns Hopkins University, and Dr. Nelson R. Trenner, instructor in chemistry at Princeton University. Dr. Ball was simultaneously appointed to a fellowship from the John Simon Guggenheim Foundation, which he has accepted. Dr. Trenner has withdrawn in order to accept a permanent research appointment.

The announcement of the awards was made by Dr. C. Lalor Burdick, secretary of the foundation. The other officers are: Dr. Charles Lee Reese, *president;* Mrs. Anna Lalor Burdick, *vice-president,* and Elwyn Evans, *treasurer.*

RECENT DEATHS

DR. HERBERT ELLSWORTH SLAUGHT, since 1931 emeritus professor of mathematics at the University of Chicago, died on May 21 at the age of seventy-six years.

DR. JOSEPH A. CULLER, professor emeritus of physics at Miami University, Ohio, died on May 18 at the age of seventy-nine years.

DR. JOHN MOORE READE, since 1908 professor of botany and from 1919 to 1926 director of the biological laboratories at the University of Georgia, died on May 8 at the age of sixty-one years.

DR. WILLARD L. WACHTER, Charles McIntyre professor of biology at Lafayette College, died on May 18 at the age of thirty-nine years.

ALEXANDER HOWARD MCCONNELL, founder and chairman of the board of directors of the Central Scientific Company, died on May 4, in his sixty-first year.

DR. HARRY G. TIMBRES, of Edmonton, Canada, died on May 12 of typhus contracted while carrying out antimalarial experiments for the Tropical Institute of Moscow.

DR. ARTHUR HARRY CHURCH, formerly reader in botany at the University of Oxford, died on April 24, at the age of seventy-two years.

SCIENTIFIC NOTES AND NEWS

DR. JOHN J. ABEL, emeritus professor of pharmacology at the Johns Hopkins University, celebrated his eightieth birthday on May 19 at a banquet given in the Welch Medical Library, which was attended by colleagues and former students. At its conclusion he was presented with a scroll bearing the names and greetings of those present. Telegrams from friends from all parts of the country were read.

A PLAQUE of Dr. Henry H. Donaldson, of the Wistar Institute of Anatomy, sculptured by Dr. R. Tait McKenzie, was presented to the Lenape Club of Philadelphia by Dr. McKenzie on the occasion of the eightieth birthday of Dr. Donaldson on May 12, and commemorating the twentieth anniversary of his presidency of the club.

DR. HARVEY CUSHING, since 1933 Sterling professor of neurology at the Medical School of Yale University, previously Moseley professor at the Harvard Medical School and surgeon-in-chief of the Peter Bent Brigham Hospital, will retire at the close of the academic year and will become professor emeritus.

SIR ANDREW MACPHAIL will retire at the end of the present summer term from the chair of medical history in McGill University, which he has held for over thirty years.

THE Daniel Guggenheim Medal for 1937, presented annually "in recognition of meritorious achievements in the furtherance of aeronautics," has been awarded to Dr. Hugo Eckener. The presentation will be made at a dinner to be given in his honor in New York on December 17, the thirty-fourth anniversary of the first flight of the Wright brothers. The medal is awarded to Dr. Eckener for "notable contributions to transoceanic air transport and to international cooperation in aeronautics."

THE Walker Prize of $100 of the Boston Society of Natural History has been awarded to Dr. V. C. Wynne-Edwards, assistant professor in the department of zoology of McGill University, for his work entitled "Isolated Arctic-Alpine Flora of Eastern North America." A second prize of $60 has been awarded to William D. Gray, of the University of Pennsylvania, for a paper on "Myxomycete Studies: The Influence of Light on the Fruiting of *Physarum polycephalum.*"

THE Royal Anthropological Institute of Great Britain and Ireland has awarded the Wellcome Gold Medal for anthropological research for 1936 to Dr. Charles Kingsley Meek for an essay entitled "Law and Authority in a Nigerian Tribe. A Study in Indirect Rule." The Rivers Memorial Medal for anthropological work in the field for 1937 has been awarded

by the institute to Dr. Edward Evan Evans-Pritchard for his field work in the Anglo-Egyptian Sudan and Kenya during the last ten years.

THE Founder's Medal of the Royal Geographical Society of London has been awarded to Colonel C. G. Lewis for his surveys on the Miri Mission, 1911–12, in Iraq and Syria, 1918–19, and on the Afghan and Turco-Iraq Boundary Commissions; for the air survey of the Irrawaddy Delta, 1924; and for his promotion and encouragement of the exploration and survey of the Himalaya.

THE degree of doctor of laws will be conferred at the commencement of Villanova College on June 3 on Dr. Charles H. Mayo and Dr. William J. Mayo, of the Mayo Foundation, Rochester, Minn.

HONORARY degrees conferred at a special convocation of the University of Manitoba in connection with its diamond jubilee celebrations included the doctorate of laws on Vilhjalmur Stefansson, the Arctic explorer.

PROFESSOR JOSEPH GRINNELL, director of the Museum of Vertebrate Zoology of the University of California, was elected president of the American Society of Mammalogists at the recent meeting held in Washington, D. C.

DR. SYDNEY CUNNINGHAM, of the School of Medicine of Vanderbilt University, has been appointed dean of the Albany Medical College, Albany, N. Y. He will succeed Dr. Thomas Ordway, who has resigned after serving for twenty-two years.

DR. HARRY STOLL MUSTARD and Dr. William Smith Tillett, both of the Johns Hopkins University, have been appointed members of the faculty of the College of Medicine of New York University. Dr. Mustard has been appointed Hermann Biggs professor of preventive medicine and director of the laboratories of preventive medicine to fill the chair left vacant by the retirement of Professor William Hallock Park. He also becomes director of the new District Health Center. Dr. Tillett will become professor of bacteriology and director of the bacteriological laboratories.

DR. KARL S. LASHLEY, professor of psychology at Harvard University, has been appointed research professor of neuropsychology and has been relieved of responsibility for routine instruction. He will offer a graduate seminary and direct research in neuropsychology.

DR. G. ALBIN MATSON, associate professor of bacteriology at the Montana State University, has been appointed to an assistant professorship in the department of bacteriology and pathology of the School of Medicine of the University of Utah.

DR. CLIFFORD C. GREGG has been appointed director of the Field Museum, Chicago. Since the death of Stephen C. Simms in January, who had held the post of director since 1928, Mr. Gregg has been in charge of the administration of the museum under a temporary appointment as acting director. He is the fourth director to hold office since the museum was founded in 1893. His predecessors have been the late Stephen C. Simms, the late David C. Davies and the late Frederick J. V. Skiff, who was the first director. A member of the staff since 1926, Mr. Gregg served as assistant to the director under both Mr. Simms and Mr. Davies.

AT a recent meeting of the executive committee of the Long Island Biological Association it was voted to appoint Dr. Eric Ponder, who has for the past year been interim director, as director of the Biological Laboratory, Cold Spring Harbor, Long Island, N. Y.

DR. M. S. NAVASHIN, of the Institute of Genetics, Academy of Sciences, U.S.S.R., has resigned the directorship of the Botanic Garden of the University of Moscow. He will henceforth devote all his time to cytogenetic research.

THE Committee on Scientific Research of the American Medical Association has made grants as follows: to Dr. Ira A. Manville, of the School of Medicine of the University of Oregon, for an extension to connective tissues of his work on the mucous epithelium; to Dr. G. Albin Matson, associate professor of bacteriology at the Montana State University, for a study of the antigenic properties of certain chemical substances; to Dr. James B. Hamilton, of Albany Medical College, for a study of the effect of male hormone substance on testicular descent, and to Dr. George M. Curtis, of the Ohio State University, for the continuation of his work on calcium and iodine metabolism as related to thyroid disease.

DR. ALEXIS CARREL, of the Rockefeller Institute for Medical Research, has sailed for Europe to pass the summer in Paris and Brussels, where he plans to continue research.

DR. GUSTAV EGLOFF, director of research of the Universal Oil Products Company, Chicago, will sail on June 2 for England. He is a delegate from the American Petroleum Institute to the Second World Petroleum Congress, to be held in Paris from June 14 to 19. He plans to spend a week in England lecturing before going to Paris to attend the congress. He will also spend some time in Holland, Belgium, Germany, Czechoslovakia and Austria, visiting refineries and oil fields in addition to giving lectures.

DR. WILLIAM BOWIE, formerly chief of the Division of Geodesy of the U. S. Coast and Geodetic Survey, gave on May 14 an address before the Rittenhouse

Astronomical Society of Philadelphia entitled "Contributions of Geodesy to Our Knowledge of the Earth."

THE twelfth Edgar Marburg Lecture will be delivered on June 30 at the fortieth annual meeting in New York City of the American Society for Testing Materials by Dr. T. Smith Taylor, professor of physics in Washington and Jefferson College. The subject of the lecture will be "Plastics: Some Applications of Different Classes, Methods of Testing."

THE second Leo Loeb Lecture, under the annual lectureship established by the Mu Chapter of Phi Beta Pi, medical fraternity, was delivered on May 14 by Dr. Anton J. Carlson, professor of physiology at the University of Chicago, on "Problems in the Control of the Endocrine Glands."

DR. EDWARD KASNER, Adrain professor of mathematics at Columbia University, recently addressed a joint meeting of Phi Beta Kappa and Sigma Xi at Rutgers University on "Imagination and Conception in Mathematics."

AT the twentieth annual meeting of the American Society of Ichthyologists and Herpetologists, held in Washington, D. C., from May 4 to 8, the following officers were elected: John T. Nichols and Leonhard Stejneger, *Honorary Presidents;* William K. Gregory, *President;* L. M. Klauber, Leonard P. Schultz and Hobart M. Smith, *Vice-presidents;* M. Graham Netting, *Secretary;* Arthur W. Henn, *Treasurer;* Helen T. Gaige, *Editor-in-Chief* of *Copeia;* Lionel A. Walford, *Ichthyological Editor;* Karl P. Schmidt, *Herpetological Editor.* Four honorary members were elected: for 1936, Professor David M. S. Watson, University College, London, and Professor Franz Werner, University of Vienna; for 1937, Dr. Leo S. Berg, Academy of Sciences, Leningrad, and Dr. W. Wolterstorff, Museum für Natur- und Heimatkunde, Magdeburg. Dr. G. A. Boulenger is the only previously elected honorary foreign member.

AT a meeting of the Ohio State University Chapter of Sigma Xi forty-nine members and forty-one associate members were elected. In the evening following the spring banquet of the society, Professor Raymond Pearl, of the Johns Hopkins University, spoke on "The Relation of Population to Fertility." Officers of the Ohio State chapter are Professor Eugene Van Cleef, *president;* Professor J. H. Gourley, *vice-president,* and Professor Fred A. Hitchcock, *secretary.*

THE Michigan Chapter of the Society of the Sigma Xi held its annual initiation banquet on the evening of May 5. Professor Jesse Ormondroyd, of the department of engineering and mechanics of the University of Michigan, delivered the address for the occasion on "The Two Hundred Inch Telescope Mounting." Five faculty members, three alumni and eighteen graduate students were elected to full membership. Sixty-six graduate students and twenty-three undergraduates were elected as associates. In addition, one faculty member and twenty graduate students were advanced from associate to full membership.

THE fourth annual initiation of the Massachusetts Institute of Technology Chapter of the Society of Sigma Xi was held on May 20. Officers elected for the next year were Professor Arthur C. Hardy, *president;* Professor Walter C. Voss, *vice-president;* Professor Bernard E. Proctor, *treasurer;* Professor John B. Wilbur, *secretary,* and Professor Hoyt C. Hottel, *elector.* The initiates elected included twenty-four members and twenty-two associates. Following the ceremonies, at which Dr. John W. M. Bunker, retiring president, presided, the initiates were guests at a dinner at Walker Memorial at which Dr. Homer W. Smith, professor of physiology of the College of Medicine of New York University, spoke on "The Lung-Fish, an Amazing Anomaly of Nature."

THE sixty-second annual meeting of the American Forestry Association, planned as a joint meeting with the Ohio Forestry Association, will be held at Cincinnati, Ohio, from May 31 to June 3. The chief subject to be considered will be water conservation and flood control. There will be a day-boat trip on the Ohio River, giving a first-hand view of after-flood scenes and river works designed to deal with flood waters in the main river; and a day's motor tour of the Muskingum Watershed Conservancy District, where source control and conservation of water is being undertaken. The Muskingum Conservancy represents the first and only large scale cooperative effort on the part of the Federal Government, the state and local communities to deal with the flood problem in a given drainage basin.

A SYMPOSIUM on the viruses was held in San Francisco on May 6 by the Pasteur Society of Central California. Three papers were presented: "The Cultivation and Handling of Viruses," by Alfred Lazarus, Edith Claypole research fellow, Hooper Foundation, University of California; "Recent Developments in the Study of Plant Viruses," by Dr. T. E. Rawlins, associate professor of plant pathology and associate plant pathologist in the Experiment Station, College of Agriculture, University of California; and "Poliomyelitis and its Problem of Control," by Dr. E. W. Schultz, professor of bacteriology and experimental pathology, Stanford University. The following officers were elected for the coming year: *President,* Dr. J. C. Geiger, director of public health of the City and County of San Francisco; *Vice-president,* Dr. Charles E. Smith, Stanford University Medical School; *Secre-*

tary-Treasurer, Dr. Herbert G. Johnstone, department of bacteriology, University of California Medical School; *Councillors,* Dr. Ethel McNeil, department of zoology, University of California, and Dr. Harry E. Foster, medical director of the Cutter Laboratories, Berkeley. The membership of the society at the close of this year is 320.

THE second annual meeting of the Oregon Psychological Association was held at Reed College on May 1. A symposium was held on "The Measurement and Evaluation of Personality," and individual research reports were presented. Professor William Griffith, of Reed College, was chairman and delivered an evening address entitled, "The House of Magic." Dr. L. F. Beck, of the University of Oregon, was elected secretary. The Oregon Normal School was selected as the place of meeting for next year.

THE Botanical Society of America and the American Society of Plant Taxonomists will hold two joint summer field meetings in August. The first of these meetings will be held at Acadia University, Wolfville, N. S., from August 18 to 21; the program for this meeting is being arranged by the officers of the Botanical Society of America. The second meeting will be held at the Biological Station of the University of Michigan at Douglas Lake, from August 24 to 27. Officers of the American Society of Plant Taxonomists are arranging the program for the Douglas Lake meeting.

DURING the summer session of the College of Arts and Science of the University of Rochester, two summer courses in photography will be given under the joint auspices of the Institute of Applied Optics of the university and the Eastman Kodak Research Laboratory. They will be under the immediate supervision of Dr. T. R. Wilkins and Dr. Walter Clark, and will be similar in nature to those given in the regular curriculum of the Institute of Optics. The elementary course will run from June 22 to July 13 and the advanced course from July 5 to July 23. The lectures in the latter course will be given by Dr. C. E. Kenneth Mees, Dr. L. A. Jones and Dr. W. Clark, of the Kodak Research Laboratories. In addition, from July 5 to July 9, there will be a course on "Photographic Photometry and Spectrophotometry," conducted by Dr. Brian O'Brien; and from July 12 to July 16 Dr. T. R. Wilkins will lecture on "The Photographic Emulsion as a Tool in Atomic Nuclear Research." During the courses trips of inspection have been planned to the Kodak Park Laboratories and the Kodak Camera Works.

THE John and Mary R. Markle Foundation of New York City has recently appropriated to the National Research Council the sum of $100,000 to be available over a three-year period for the support of research in endocrinology. This fund will be administered by a committee of the Division of Medical Sciences of the council to be appointed later this spring and will be allotted in grants for the support of approved programs of research in this field to be conducted in institutions which may wish to collaborate in these investigations.

DISCUSSION

THE FLORA OF CALIFORNIA

WITHOUT attempting an adequate review, I venture to call attention to some of the features of W. L. Jepson's "Flora of California," Vol. 2, Capparidaceae to Cornaceae, a work of 684 pages published at the University of California last year. It is one of the most interesting and stimulating floras I have seen, and is especially to be valued for its full discussions of debatable points and the historical data often given with the more important species. We may envy the Californian students of flowering plants, who are now so well provided with information concerning the very unique flora of the Pacific Coast region. It must not be thought, however, that discoveries are no longer possible. There is very much to be found out, and such works as Jepson's should stimulate zeal for investigation, by providing a basis for the judgment of such observations as may be made.

One feature in Jepson's work which I greatly regret is his custom (following the old "Kew rule") of citing as the authority for a species or variety the writer who proposed the combination used. Thus the common water-cress, named *Sisymbrium nasturtium-aquaticum* by Linnaeus in 1753, appears as *Radicula nasturtium-aquaticum* Britten and Rendle, 1907. Such usage hides the true history of the plant, and prevents the recognition of the original describer. The usual custom of botanists to-day is to cite the original author and also the author of the combination, thus: (Linnaeus) Britten and Rendle. In zoology, however, we use the double citation only in formal monographs, if at all, and I have never been able to see that we lost anything of value by the omission of the author of the binomial or trinomial accepted, when that is based on an earlier name. It is perhaps ungracious to say it, but one can not avoid a suspicion that sometimes the double citation or the single citation, as given by Jepson, acts as a stimulus to the formation of new combinations.

Another quite different matter has to do with the

ognition of genera. It is very inconvenient to students to find marked differences in the standard works of Jepson, Munz and Abrams, all dealing with the west coast flora. It should be possible to form a committee to reach a common agreement on these matters. There is no fixed rule for the recognition of a genus, and in many cases possible alternatives seem about equally admissible. Take, for instance, the genera of Cruciferae, and examine Jepson's key for their recognition. We find, for example:

Flowers yellow, or often white in Nos. 4 and 5 (four genera)
Flowers white or whitish (rarely yellowish) to purple or purplish (four genera)

or again:

Seeds in 1 row in each cell (except 2 species in No. 5 and several in No. 16 (nine genera)
Seeds 2 rows in each cell (2 genera)

These definitions well illustrate the difficulty of sharply limiting the genera, yet nearly all the genera cited are readily recognizable in the field by their "facies." Munz recognizes *Descurainia* (often called *Sophia*), which differs from *Sisymbrium* by the forked hairs, and by its characteristic appearance. Jepson merges it in *Sisymbrium*, which then becomes an assemblage of very different looking plants. I think it is a good genus, but that is more or less a matter of opinion.

Another obvious criticism has to do with the numerous "varieties" proposed or cited. Apparently the intention usually is to recognize such units as we term subspecies in zoology, but there is no doubt a mixture of forms due to the direct influence of the environment. The intergradation which leads botanists to reduce plants to varietal rank may be due to crossing. Botanists must not be blamed for this inexact treatment, since they usually lack the necessary information for more correct judgments. But each "variety" may be taken as a sort of challenge to the coming generation of workers to determine its real biological significance.

We miss, in all these botanical works, any reference to the animal life associated with the plants. It is singular that botanists rarely take the least interest in the insects which bring about the fertilization of the flowers, those which devour the various parts of the plant, or form galls. Every species of plant is a stage on which a drama of animal life is enacted, and some day, we may hope, this will be recognized and the facts properly described and illustrated. Here is a vast field for study, rich in opportunities for discovery.

T. D. A. COCKERELL
UNIVERSITY OF COLORADO

SPARGANA IN NATRIX

IN SCIENCE for January 29, Dr. L. J. Thomas reports the finding of spargana (larvae of the cestode genus Diphyllobothrium) in a Natrix taken near Ithaca, N. Y. These spargana had been collected by Mr. Elmer Brown, of Cornell University. The first instance of spargana in water snakes in this country to come to my attention was a case related to me verbally in December, 1936, by Dr. George R. La Rue, of the University of Michigan. In this instance the spargana were found in a water snake taken in the Okefinokee Swamp, Georgia. In neither of the above cases were the spargana fed to suitable definitive hosts to determine what species was represented.

I wish to report here the finding of spargana in Natrix from Florida. In February, 1937, two lots of Natrix, one from Sarasota, the other from Silver Springs, Florida, were examined for spargana, and found to be about 90 per cent. infected. The number per snake varied from one to seven. These spargana were in all respects similar to the larvae of *Diphyllobothrium mansonoides* Mueller, the only *Diphyllobothrium* known from this country which might be presumed to infect Natrix in the larval stage. The larvae in this case have been fed to numerous suitable definitive hosts, and it should therefore be possible shortly to determine the exact identity of this parasite.

I have previously reported, in a preliminary note on the life history of *D. mansonoides*, the failure to infect snakes with the sparganum of this parasite. However, in these experiments garter snakes were used instead of Natrix, it being supposed that the genus of snakes would make little difference in the outcome of experiments on a larva which has such a wide diversity of hosts as the sparganum of *D. mansonoides*. Probably this supposition was in error.

A very limited number of Natrix from the vicinity of Syracuse were examined for spargana during the summer of 1936, but were reported negative. In this connection it is of interest to note that Mr. Elmer Brown, finder of the sparganum reported by Thomas, states in a personal letter: "Frankly, I am not optimistic over the prospect of the forms being found again very readily. I have dissected a good many snakes from this region, but I am reasonably certain that the specimen of last spring was the first I have opened which carried this genus." This is in conflict with the idea that this sparganum is the larva of *D. mansonoides*, since this parasite, in the adult stage, occurs very commonly in cats in this region, and therefore its larva should occur commonly in all potential hosts.

With experiments and further work now under way, it should be possible very shortly to clear up this puzzling and very interesting question.

NOTE: Since this article was first sent in to SCIENCE, the adult cestodes have been recovered from experimentally infected cats, and found to be of two different types, the one morphologically identical with *D. mansonoides*, the other resembling *D. mansoni* in general, but apparently differing from this species in certain important respects. In any case this is the first record of this second form for this country. It is clear therefore that Florida water snakes are infected with two different species of spargana. Further work on these forms will be reported elsewhere.

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PHOTOMICROGRAPHS AND MICROPHOTOGRAPHS

IN the March 5 issue of SCIENCE Professor Luyten made some interesting comments on scientific nomenclature, refers to the term "photomicrograph" as a "horrible hybrid" and expresses his preference for the term "microphotograph," which he recommends as the proper word. This was particularly interesting to me because at about 1912 I wrote numerous abstracts of German papers on the subject of "Metallography" and in these abstracts I repeatedly used the word "microphotograph," only to have the editor of *Chemical Abstracts* invariably change the word to "photomicrograph." At that time, I was rather peeved because I preferred the sound of the word that I used and it was a more literal translation of the German text which I was following. The learned editor of *Chemical Abstracts* carefully pointed out to me that the reader might imagine the word "microphotograph" to signify a very small photograph, whereas I meant the photograph of something that the naked eye could not perceive because the camera was placed over a microscope and the photograph, which was of perfectly normal size, represented a magnification of perhaps 500 diameters.

I have on my desk a 1937 edition of Webster's Collegiate Dictionary, and the term "microphotograph" and "photomicrograph" are both defined in the above sense, although under the former definition a secondary meaning is given as follows: "loosely a photomicrograph." The term "horrible hybrid" is usually applied to words derived from two languages. Thus the term "monovalent," which is often carelessly used by chemists, is frowned upon and it is considered better to use the term "univalent" because "valence" is derived from a Latin word and *uni* expresses in Latin the same idea that *mono* does in Greek. Since the three parts of "photomicrograph" are all derived from Greek words the word can hardly be called a "horrible hybrid."

If Professor Luyten's communication had been written in 1912, I know I should have hailed it with joy, but I have learned a lot since then and have come to the conclusion that the editor who compelled me to use the term "photomicrograph" twenty-five years ago was wiser than I and did me a service in correcting my writings.

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A MISLEADING ARTICLE IN THE AMERICAN MAGAZINE

IN the May, 1937, issue of *The American Magazine* appeared an article under the name of H. H. Nininger, curator of meteorites in the Colorado Museum of Natural History. This article, which was entitled "It Pays to Keep Your Eyes Open," was not written by Mr. Nininger, as the by-line implies, but by the writer of this statement. Mr. Nininger was responsible for only the portion of the article which deals with meteorites and fossils. The portion dealing with plants and Indian relics was appended by me, solely on my own responsibility.

The original version of the article, which was the only version approved by Mr. Nininger, contained almost no reference to plants or Indian relics. These references were added, without his knowledge, when the editor of *The American* requested me to "fatten" the article. Furthermore, the article was intended to appear "As told to Frank Clay Cross," not as Mr. Nininger's own work.

I have long enjoyed an intimate friendship with Mr. Nininger, and the fact that this article has caused him considerable embarrassment is a matter of great regret to me. If any reader has drawn the inference from it that he is, in any sense, interested in the commercialization of science, that inference is entirely unjustified. The whole blame must rest on me.

This statement is written entirely on my own volition to correct an unfortunate error, in so far as it is possible for me to correct it.

FRANK CLAY CROSS

QUOTATIONS

THE SOVIET POLAR EXPEDITION

THE landing of a Soviet plane at the North Pole and the setting up of the first permanent North Pole weather and scientific station is an achievement that is receiving the wide and enthusiastic acclaim it deserves. It was not of course a "discovery." Neither was it the

first aerial exploration of the Pole. Admiral Byrd, with Floyd Bennett, flew over it in 1926, Roald Amundsen, Lincoln Ellsworth and Umberti Nobile crossed it in the dirigible *Norge* in the same year and in 1928 Nobile returned in the dirigible *Italia,* crossed the Pole a third time, was wrecked on his return trip and saved in the epic of rescue performed by the Soviet icebreaker *Krassin.*

The importance of the flight and landing of Professor Otto Schmidt and A. V. Vodopyanoff, one of the most famous of Russian aviators, and their companions consists rather in their having been the first to follow up a flight to the Pole with the attempt to establish the first permanent polar station, equipped with scientists, wireless and a landing field for planes. The latter is most necessary, for the Soviet believes apparently in "mass" tactics even in polar expeditions —four more planes are prepared to reinforce the first arrivals.

Dramatic as it undeniably is, this feat actually is only another step in the detailed and ambitious program for subduing the Arctic and sub-Arctic regions which the Soviet Government has been steadily and boldly carrying forward for years. With so much of its own territory lying in the far north, the U.S.S.R. seeks to work an economic transformation in this great area, opening up new regions and establishing new shipping services. The world has heard of the remarkable exploits of the *Krassin* and *Cheliuskin,* but the Arctic voyages of the icebreakers *Sedov, Litke, Malygin* and *Sibirakov* have been, perhaps, not less important. In 1934, for example, some thirty Russian expeditions with some forty ships and planes were active in the far northern regions and thirty-eight stations, many with large staffs, were set up on Arctic coasts and islands. And behind the large corps of scientists and sailors and airmen which it has trained for this work, has moved the government, founding new towns, breaking new paths. It is all part of the plan for unlocking the vast resources of the Soviet Union, creating new trade routes and perhaps even providing new strategic lines.

In its turn the work of the Russians logically folllows and extends the explorations of such men as Ellsworth and Byrd in the Arctic and Antarctic, by developing further the use of the airplane and laying firm foundations for scientific observation. Whether the hope that the Russians entertain for using the Pole as a base for a commercial air line from Moscow across the North Sea to San Francisco will materialize must wait upon these studies and a number of other experiments calling for courage and skill in high degree. It appears to be the belief of Professor Schmidt, who is the director of the Soviet Arctic Institute and Northern Sea Route Administration, and, it seems, the intellectual mainspring of Russia's bold pioneering ventures, that such a line will be practicable two years after the completion of surveys. In any event, a brave and auspicious beginning has been made and the world can take pleasure in laying aside all political considerations to applaud the courage and success of those who by employing the new tools of science and aviation have written this latest bright chapter into the history of man's conquest of nature.—*The Baltimore Sun.*

SOCIETIES AND MEETINGS

THE KANSAS ACADEMY OF SCIENCE

THE sixty-ninth meeting of the Kansas Academy of Science was held at the Kansas State College of Agriculture and Applied Science at Manhattan, Kansas, on April 1, 2 and 3, with Lawrence Oncley, professor of chemistry at Southwestern College, Winfield, Kansas, presiding. The committee on arrangements for this meeting consisted of E. C. Miller, chairman, Martha Kramer, E. C. Chapin and M. J. Harbaugh, all of Manhattan.

The meeting opened before an audience of about 800 with a demonstration of some new sound films which are suitable for teaching aids. This demonstration was followed by a showing of his original film on "How Things Grow" by W. J. Baumgartner, of the University of Kansas.

The first general session of the academy was held on Friday morning, April 2, at which time nine papers of general interest and eight papers on geology were presented. Thirty-five geologists and guests under the leadership of A. B. Sperry went on a field trip on Friday afternoon to examine some igneous outcrops near Riley, Kansas. At the same time the following sections met for hearing papers:

Botany, 19 papers, J. H. Doell, Bethel College, presiding.
Chemistry, 15 papers, L. E. Blackman, Kansas State Teachers College, Emporia, presiding.
Physics, 15 papers, Louis R. Weber, Friends University, Wichita, presiding.
Psychology, 13 papers, Edwina A. Cowan, Friends University, presiding.
Zoology, 33 papers, John Breukelman, Kansas State Teachers College, Emporia, Kansas, presiding.
Junior Academy, five clubs on program with Hazel Branch, University of Wichita, in charge and an attendance of 100.

On Friday evening, the annual banquet was held at the college cafeteria, with George A. Dean, the first vice-president, as toastmaster and 125 persons in atten-

dance. Public announcement was first made at the banquet of the establishment of the Albert B. Reagan endowment by a gift of $1,000 by Mrs. Otilla Reagan, wife of the late Dr. Albert B. Reagan, of Provo, Utah. Dr. Reagan, who has published more than 500 papers, chiefly in the fields of archeology and anthropology, particularly of North American Indians, died last May. After his retirement from his work in the Department of the Interior, Division of Indian Affairs, he was made special professor of anthropology at Brigham Young University. The income from the endowment which has been established by Mrs. Reagan is to be granted annually by the committee on awards to one or more members of the academy who apply for it for the purpose of completing and publishing scientific papers. Articles governing the administration of this fund were adopted at the business meeting. Mrs. Otilla Reagan was introduced at the banquet, following which Professor Roy Rankin told of the life and work of Dr. Reagan.

Mrs. Eusebia Irish, daughter of Benjamin Mudge, a founder and the first president of the Kansas Academy of Science, was likewise introduced. She spoke briefly of her distinguished father, who was so influential in early scientific work in Kansas.

President Lawrence Oncley gave the annual presidential address at the banquet on the subject, "Some Reflections upon the Teaching of General Chemistry." Following the banquet, the annual invitation address was given in the college auditorium by Charles F. Hottes, head of the department of botany at the University of Illinois, on "The History of the Bald Cypress and Redwood." This interesting address, which was illustrated by colored slides, had an attendance of approximately 750.

On Saturday morning, two general interest papers were given, followed by a symposium by the Committee on Conservation and Ecology upon the small area of unusual rock concretions near Minneapolis, Kansas, which the academy wishes made into a national park for preservation. Over 100 spherical sandstone concretions 16 to 24 feet in diameter, many of which are almost perfect spheres, lie more or less fully exposed. Walter H. Schoewe has sponsored the work of this committee and led the symposium, followed by W. H. Horr, Charles E. Burt and L. D. Wooster.

The symposium was followed by the business meeting. Several amendments to the constitution were adopted. The secretary reported the total membership to be 541, consisting of 10 honorary, 49 life members and 465 annual members; 105 persons joined the academy since the last meeting. The 1936 volume of the *Transactions* was in galley proof at the time of the meeting. The treasurer reported a balance of $546 and $2,452 in the academy endowment fund. The committee on awards, consisting of L. C. Wooster, *chairman*, J. C. Peterson and R. Q. Brewster, reported having made research grants of $50 to J. P. Puffinbarger, of the University of Kansas, and $50 to S. L. Loewen, of Sterling College. The academy contributed $25 to the fund of $75 supplied by the American Association for the Advancement of Science to make $100 for grants.

The nominating committee reported the following nominations to office for 1937–38:

George A. Dean, *president*, Kansas State College, Manhattan.

W. H. Schoewe, *president-elect*, University of Kansas, Lawrence.

H. H. Hall, *vice-president*, Kansas State Teachers College, Pittsburg.

Roger C. Smith, *secretary*, Kansas State College, Manhattan.

H. A. Zinszer, *treasurer*, Fort Hays Kansas State College, Hays.

Three additional members to the executive council: Lawrence Oncley, Southwestern College; J. H. Doell, Bethel College; and R. H. Wheeler, University of Kansas.

Editorial Board: W. J. Baumgartner, *managing editor* (reelected), University of Kansas; Frank C. Gates continues an unexpired term as editor-in-chief of the *Transactions*.

Associate editors: Louis R. Weber, Friends University, to fill unexpired term of W. W. Floyd; G. A. Kelly, Fort Hays Kansas State College.

Following the business meeting, the Kansas Entomological Society, which is affiliated with the academy as the section on entomology, held its thirteenth annual meeting, with D. A. Wilbur as chairman and R. L. Parker as secretary. Twenty-four papers were presented, with an attendance of seventy-five.

The Kansas and Nebraska chapters of the American Association of University Professors also met following the academy business meeting in cooperation with the academy this year, with an attendance of 90. D. A. Worcester, of the University of Nebraska, was regional chairman, while R. W. Conover, C. M. Correll and Kingsley Given served as meeting chairmen.

The Entomological banquet was held at the Manhattan Country Club on Saturday evening, with George B. Wagner as master of ceremonies. After words of greeting by Professor Dean to the group of 75, the local entomologists provided entertainment.

The following sectional chairmen were elected for 1937–38:

Botany, Miss Margaret Newcomb, Kansas State College, Manhattan.

Chemistry, Lloyd McKinley, University of Wichita, Wichita.

Entomology, Warren Knaus, McPherson, Kansas.
Physics, C. V. Kent, University of Kansas, Lawrence.
Psychology, O. W. Alm, Kansas State College, Manhattan.
Zoology, Claude Hibbard, University of Kansas, Lawrence.
Junior Academy, Oscar Klingman, Junction City.

Among the new committees appointed by President George Dean was a new Junior Academy Committee, consisting of J. R. Wells, Pittsburg, John M. Michener, Wichita, and Edith Beach, Lawrence, and a new committee to study the issuance of a series of natural history hand-books by academy members, consisting of Frank C. Gates, *chairman*, E. J. Wimmer and W. H. Schoewe.

A total of 307 members registered for the academy meetings, 52 for the university professors meeting and 72 for the entomological meetings.

The next annual meeting of the academy will be held during the spring of 1938 at the Kansas State Teachers College, Pittsburg. It was also agreed that the seventy-first meeting will be held at the University of Kansas, Lawrence, during the spring of 1939.

ROGER C. SMITH,
Secretary

REPORTS

THE UNION OF AMERICAN BIOLOGICAL SOCIETIES AND BIOLOGICAL ABSTRACTS

AT a meeting of the Council of the Union held in Atlantic City on December 28, 1936, E. V. Cowdry was elected president; G. W. Hunter, III, secretary; Ivey F. Lewis, treasurer; and W. C. Curtis, E. B. Krumbhaar and E. D. Merrill additional members of the executive committee.

The members of the Union are:

American Association for the Advancement of Science
  Section F, Zoological Sciences
  Section G, Botanical Sciences
  Section N, Medical Sciences
  Section O, Agriculture
American Association of Anatomists
American Association of Economic Entomologists
American Association of Immunologists
American Dairy Science Association
American Genetic Association
American Ornithologists' Union
American Physiological Society
American Phytopathological Society
American Society of Agronomy
American Society of Biological Chemists
American Society of Clinical Pathologists
American Society for Experimental Pathology
American Society for Horticultural Science
American Society of Ichthyologists and Herpetologists
American Society of Mammalogists
American Society of Naturalists
American Society of Parasitologists
American Society for Pharmacology and Experimental Therapeutics
American Society of Plant Physiologists
American Society of Zoologists
Botanical Society of America
Ecological Society of America
Entomological Society of America
Genetics Society of America
National Research Council
  Division, Biology and Agriculture
Poultry Science Association
Society of American Bacteriologists
Society of American Foresters
Society for Experimental Biology and Medicine

According to its constitution, the objects of the Union are ". . . to stimulate investigation in the field of biology, to organize and promote the interests of bibliography and publication, to deal with questions of general interest in the field of biology and in general to promote the solution of those broad problems which the specialized societies are not in a position to support effectively, and to do anything else which may serve these ends."

Under the presidency of W. C. Curtis, the Union sponsored *Biological Abstracts* and it is proposed to continue giving all possible assistance to this important project. A very encouraging feature of the Atlantic City meeting of the American Association for the Advancement of Science was wide-spread approval of the editorial management of *Biological Abstracts* and of the service which it renders. The biological sciences include many divergent specialties. To have them integrated in this way is highly desirable and one of our greatest needs if civilization is to profit by the so-called "life-sciences." That biologists generally are eager not only to give time and energy to the arduous task of careful abstracting but, in addition, to actually contribute financial support for necessary expenses was abundantly demonstrated. Of the societies meeting during the Christmas holidays, the American Society of Zoologists, the Botanical Society of America, the American Society of Parasitologists, the Genetics Society of America and the Ecological Society of America all voted an assessment on their members, in some cases mandatory, in others not mandatory. The American Genetic Association issued an informal request for aid. Moreover the Society of American Bacteriologists, the American Society of Naturalists, the American Limnological Society, the

Poultry Science Association and the Society of American Foresters made generous contributions from their treasuries; others still have the matter under consideration. A special committee of the National Academy of Sciences is cooperating with the Union and the National Research Council in a vigorous campaign to raise sufficient funds to permanently establish *Biological Abstracts* on a secure foundation. The membership of this committee is: Ivey F. Lewis, *chairman,* A. Parker Hitchens, C. E. McClung, Herbert Osborn, G. H. Parker and L. B. Wilson. The Union has requested the board of trustees of *Biological Abstracts* to submit a statement of the present status of *Biological Abstracts.* This is appended.

Last year the Union appointed, and decided to sponsor in the same way, a committee on biological science teaching, consisting of Oscar Riddle, *chairman,* E. V. Cowdry, H. B. Glass, B. C. Gruenberg and F. L. Fitzpatrick, whose efforts are directed particularly toward improvement in the teaching of all branches of biology in secondary schools.

Suggestions are invited from the member societies, and from all who are interested as to other services which the Union of American Biological Societies may properly perform.

Present Status of Biological Abstracts

The members of the Board of Trustees of *Biological Abstracts* are: C. E. McClung, president; A. F. Woods, vice-president; J. R. Schramm, editor; Chas. M. B. Cadwalader, treasurer; I. W. Bailey, H. C. Bazett, A. F. Blakeslee, A. Parker Hitchens, C. A. Kofoid, Walter Meek and Herbert Osborn. Frederick V. Rand serves as secretary to the Board. The following statement is offered:

Underlying *Biological Abstracts* is a broad principle. Increasing volume and specialized character of new information has elevated integration and synthesis to the position of commanding problems. Among the many ways in which this integration is fostered in biology, none appears to be as permanently effective, economical and free from geographical limitations as a comprehensive abstracting service provided with excellent indexes. *Biological Abstracts* was therefore undertaken not as a passive bibliographic tool but as an instrument susceptible of development into a constructive force in the integrated development of the science.

The service, issuing its first volume in 1927 and its eleventh in 1937, was made possible by support from the Rockefeller Foundation. This subsidy expired in 1935. A review of the situation in 1935 by a special Committee on *Biological Abstracts* of the Science Advisory Board led to the conclusion that the value of the instrument was thoroughly established and that every means would be sought for its permanent support. This special committee, now a subcommittee of the Government Relations and Science Advisory Committee of the National Academy of Sciences, is endeavoring to develop a stable and adequate financial basis for *Biological Abstracts.* In these efforts the Union, the Board of Trustees of *Biological Abstracts* and the Division of Biology and Agriculture of the National Research Council are lending their fullest cooperation. Meanwhile the service is in a very precarious position, being maintained by temporary emergency measures, including financial contributions from the member societies of the Union, either through membership assessments or treasury grants.

Biological Abstracts may be said to be in process of development, with its objectives at the moment only partly realized but distinctly in sight. Not having been able to pay honoraria for abstracting, it has not achieved the desired uniform promptness. Payment of honoraria, long recommended by the editors, would correct this shortcoming. Availability of funds for honoraria would also enable *Biological Abstracts* to bring the abstracting of the research literature within its scope to satisfactory completeness.

Probably most serious has been the delay in the indexes. The editors rightly adhered tenaciously to the principle that the permanent reference value of the service depended almost entirely upon the quality of its indexes. The original organization of these indexes was a colossal task. Handicapped by inadequate funds, delays occurred. But the thorough ground work in the earlier indexes is reflected in more rapid progress on the later ones. Only one index is now in arrears, and it will appear in the summer of 1937.

It is generally agreed that these highly integrated indexes have achieved an unusual standard of excellence. Inconvenient as has been the delay in their appearance, the thoroughness of the work assures to the volumes of *Biological Abstracts* extraordinary permanent reference value. And now that the essential organization work is completed and the technique mastered, serious delays in indexes of future volumes are unlikely.

Biology is a diversified science. But the interdependence of its several branches is increasingly evident. Advances are linking together fields in fruitful and unpredictable ways, with a wholesome disregard of boundaries between traditional disciplines. The comprehensiveness of *Biological Abstracts* with its interlocking indexes is powerfully promoting this salutary integration. At the same time its sectional arrangement and detailed indexes adapt it to meet analytical needs.

Biology thus has an instrument which appears to

be admirably adapted to serve constructively its best interests, requiring only further development along the general lines indicated. The problem now is almost wholly a financial one. Contributing as volunteer abstracters and section editors, and often as subscribers as well, biologists individually, both here and abroad, have from the beginning lent very impressive support. This, and the increasing material contribution from the organized societies of biologists, is indicative of the wide-spread determination to maintain and develop *Biological Abstracts*. But, as clearly foreseen from the beginning, such support, including subscription income, probably at best can not provide more than one third of the funds necessary to maintain *Biological Abstracts* adequately, even in the immediate future. At the same time, such support on a still broader basis is indispensable to the present efforts to secure the necessary additional permanent funds from other sources.

The adequate solution of the financial problem of *Biological Abstracts* is admittedly difficult. But in view of the investment made, the service already rendered and the great potentialities ahead, it is incredible that it should now fail for lack of adequate financial support.

E. V. COWDRY

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SPECIAL ARTICLES

EXPERIMENTAL DETERMINATION OF THE ANTICONVULSANT PROPERTIES OF SOME PHENYL DERIVATIVES[1]

THE introduction of bromides and later of phenobarbital may well be considered the two greatest steps forward ever made in the practical treatment of the convulsive state. In view of the prevalence of the condition and the urgent need for better means of controlling it, there have been surprisingly few attempts to survey the field for even more effective medication. One difficulty has been to devise a standard means of producing convulsions in animals for preliminary studies. The use of convulsant drugs (for example, in the hands of Keith,[2] Elsberg and Stookey[3]) have not been thoroughly satisfactory. Fulton and Keller[4] have compared the effect of various anesthetics on the excitability of the cerebral cortex to electrical stimulation. Krasnogorosky[5] has used an arrangement of electrodes somewhat similar to ours for the purpose of producing experimental convulsions, and Spiegel[6] has designed an apparatus for determination of the convulsive reactivity by gradual electrical stimulation of the brain with the skull intact, using electrodes placed upon the eyeballs. We are indebted to Dr. Frederic A. Gibbs for suggesting that a modification of these methods could be used for our purposes and to Dr. Paul Hoefer for help in devising one which has proved simple and practical.

As used at present, the stimulator consists of a 45-volt radio battery, discharging through a commutator operated by a motor and through a potentiometer of 50 ohms. One end of the potentiometer is wired through a 0–50 milliammeter to an occipital electrode and the sliding connection is wired to a mouth electrode. Thus, it is possible to apply shocks at various speeds and at various amperages (Fig. 1).

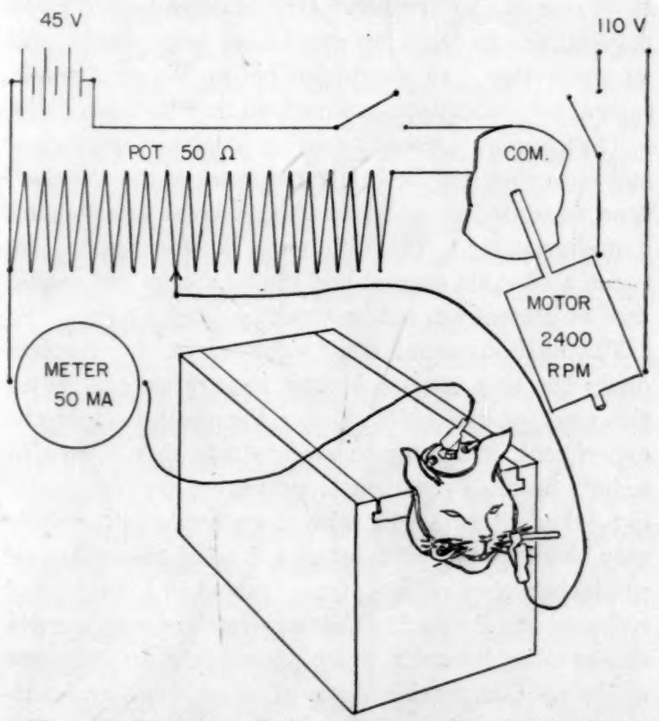

FIG. 1. Diagram of the wiring employed, permitting an interrupted current of determined amperage to be applied through an animal's head to determine the threshold for convulsions.

[1] From the Department of Neurology, Harvard Medical School, and the Neurological Unit, Boston City Hospital, Boston. This work was aided by a grant from Parke, Davis and Company.

[2] H. M. Keith, *Am. Jour. Dis. Child.*, 41: 532, 1931. Also, *Jour. Pharmacol. and Exper. Therap.*, 44: 449, 1932.

[3] C. A. Elsberg and B. P. Stookey, *Arch. Neurol. and Psychiat.*, 9: 613, 1923.

[4] J. F. Fulton and A. D. Keller, *Surg. Gynec. and Obstet.*, 54: 764, 1932.

[5] N. I. Krasnogorosky, International Physiological Congress, Leningrad, Moscow. August 9–17, 1935. Summaries of Communications, p. 213.

[6] E. A. Spiegel, "Quantitative Determination of the Convulsive Reactivity by Electrical Stimulation of the Brain with the Skull Intact." *Jour. Lab. and Clin. Med.* (to appear).

In practice, cats have been used as test animals, confined in cat boxes. One electrode is a stout wire bit placed in the animal's mouth, the other a metal plate between the ears, upon an area of fur which has been thoroughly moistened with soap solution. The two electrodes are kept in place by a simple bridle of string. Experiment shows that convulsions are produced at a slightly lower amperage if the speed of the commutator is increased up to 80 contacts per second (the limit available with the apparatus employed) than at lower speeds. The current is turned on for 10 seconds for each test; if the stimulus is above threshold, a convulsion will often begin in less than half this time. As there are no means of predicting accurately what the resistance of the circuit will be, the slider is adjusted to the desired milliamperage after the switch is closed.

The animals appear to be unconscious while the current is flowing, though naturally rigid. The method appears to involve no undue cruelty, and indeed is similar to that used for executing stray animals by some animal protective societies. A convulsion is marked by the persistence of tonic and clonic movements for a variable interval after the current is turned off, dilation of the pupils and subsequent stupor. Each animal has a characteristic threshold—usually between 6 and 15 milliamperes under the conditions stated—which seldom varies spontaneously more than 10 per cent. on any one day, and usually less than 25 per cent. from one day to another. If 5 minutes is permitted between shocks when no convulsion is produced, and an hour after each convulsion before the next shock, several determinations of threshold may be made daily.

The apparatus would probably be almost as efficient and somewhat simpler if a transformer of the "Variac" type were used on an alternating current line through a milliammeter. The difference in effectiveness between a 60-cycle current and the 80 shocks per second used at present can not be great.

The anticonvulsant effect of most of the common drugs has been studied by this apparatus, continuing the work of Spiegel.[6] Under the conditions of the experiment, it is easy to demonstrate that a dose of sodium bromide sufficient to prevent a cat from walking (about 2 gm) will raise the convulsive threshold only about 50 per cent., while a dose of phenobarbital producing similar symptoms (about 0.1 gm) may treble or quadruple it. Cats so protected may survive shocks of an intensity which proves fatal to untreated animals. Comparable doses of other familiar barbiturates have little anticonvulsant activity. This, and the fact that Harrison, Mason and Resnik[7] have produced evidence that the conjugated phenols are responsible for the motor depression of uremia suggested a search among phenyl derivatives as well as among standard hypnotics.

Accordingly, a large number of the less toxic phenol compounds was studied. They included phenyl, cresyl and tolyl sulfonates, benzoates, ketones and esters of such radicals as carbamic, malic, barbituric acids and hydantoin. The compounds which appear to have the greatest anticonvulsant activity combined with the least relative hypnotic effect of those tested so far are diphenylhydantoin, acetophenone and benzophenone.

Whether the drugs found most effective under the conditions of the test will also prove of value in clinical practice remains to be seen. The experimental method appears, however, to constitute at least a provisional index of their activity.

TRACY J. PUTNAM
H. HOUSTON MERRITT
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[7] R. T. Harrison, M. F. Mason and H. Resnik, *Jour. Clin. Invest.*, 15: 463, 1936.

EXTRACTION OF THE NITROGENOUS MATERIALS FROM DRIED GRASS[1]

As a part of a quantitative study of the nutritionally essential amino acids in the more important forage plants, it was considered highly desirable if not absolutely necessary to find a method for removing all the protein from such materials.

It is the object of this paper to report that extraction of the air-dry grass in a Soxhlet apparatus with 90 per cent. formic acid brings most of the sample into a solution which includes *all* the nitrogen. This procedure was developed as a result of some experiments in which several reagents were tested by agitating samples of grass at room temperature with successive small portions of each reagent. Ninety per cent. formic acid was found most effective, removing about 88 per cent. of the total nitrogen. Since repetition of this treatment removed further small quantities of nitrogen, it was decided to try the Soxhlet method of extraction. When the charge was mixed with a suitable material to facilitate percolation, such as 50-mesh ground glass, the Soxhlet extraction was completed in three to eight hours. Aliquots of two such extracts, representing 0.2 g of grass, contained 5.21 and 5.07 mg of nitrogen or an average of 100.8 per cent. of that present in the grass. Such extracts are being examined to determine their usefulness in a study of the nutritionally essential amino acids.

It is interesting to note that in a material containing

[8] H. H. Merritt, T. J. Putnam and D. M. Schwab. Material in preparation.

[1] Contribution from the Bureau of Plant Industry in cooperation with the Bureau of Animal Industry. The possibility of using formic acid as a protein solvent was suggested by Dr. H. W. Titus, of the latter bureau.

22.2 per cent. of crude fiber, the residue from this extraction averages 21.9 per cent., but *it must not be inferred* that the two substances are identical.

In a limited search of the literature two pertinent papers by Dr. R. H. Carr were found. In the first, "Structure of Plant Compounds and Solubility,"[2] it is reported that not much protein dissolves in cold 75 per cent. formic acid. In the second, "Preparation of Transparent Specimens of Leaves, Worms, Bees, Butterflies, etc."[3] it is reported that cold 90 per cent. formic acid dissolves most of the proteins of both plant and animal tissues. There are no analytical data in either of these papers.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

EGGS OF FRESH-WATER FISHES SUITABLE FOR LABORATORY STUDIES

BRINLEY and Creaser, in 1931, published a short article on eggs of fresh-water fishes suitable for physiological research.[1] Since that time, one of us (F. J. B.) has continued the study with the hope of extending the list and adding new species that would produce eggs at other times, so that there would be a continuous supply of eggs during the entire year.

Trout and Salmon: Eggs or embryos of the brown (*Salmo fario*) and rainbow (*S. irideus*) trout, and the Atlantic salmon (*S. solar*) have been used by a number of investigators and may be readily obtained from the various state hatcheries during the late fall and early winter months. The eggs in the "eyed" state can be shipped long distances in cool damp moss packed in thermos jugs.

If running, cool spring water is not obtainable in the laboratory, the embryo may be kept until after the yolk is absorbed (March or April) in shallow dishes, such as finger bowls, in a refrigerator, maintained at a temperature of 8 to 10° C. A supply of pond water should be kept in the refrigerator, and water in the dishes should be changed daily. The dishes must be kept clean and all dead embryos removed. The eggs vary in size from 5–8 mm in diameter, and not more than 50 eggs should be kept in a finger bowl. The eggs are covered with an opaque shell which must be removed in order to see clearly the enclosed embryo. It has been found that the embryos develop faster, with less mortality, and that the dishes are more easily kept clean from fungus and scum if the shells are removed as soon as they are received from the hatchery. As the fish develop and the gills begin to function, the water should be filtered to remove any scum or fungus, which, when taken into the mouth of the fish during respiration, will clog the gills and result in suffocation. If this accumulation on the gills does occur, the stringy scum can be removed by gently pulling and working it loose from the gills with dissecting needles and fine pointed forceps. This condition has been erroneously called a fungus disease by several authors.

Great northern or common pike (*Esax lucius*) and the wall-eyed pike (*Stizostedion vitreum*) spawn in the early spring, and their eggs may be obtained from hatcheries during March and April in this latitude and kept under the same conditions as stated above. These eggs are much smaller, averaging about 3 mm in diameter. The wall-eyed pike embryos become very active as soon as the shells are removed, therefore they are difficult to study and their use for physiological investigation is rather limited. The egg of the common pike is well adapted for class and research use.

Eggs of the European carp (*Cyprinus carpio*) may be taken in large numbers by collecting those that are naturally spawned in the shallow water along the shore of lakes or ponds. Spawning takes place in early to mid-morning and the males can be observed chasing the females in the shallow water. It has been reported by Forbes and Richardson[2] that 400,000 to 500,000 eggs have been taken from a four- to five-pound female. By observing the fish at spawning time, fertilized eggs may be collected shortly after being laid. The adults may also be seined at the time of spawning and the eggs stripped from the female and fertilized by sperm from the male.

The eggs are considerably smaller than the pike, and there is a transparent jelly-like substance between the egg shell and the embryo, which interferes with the removal of the shell. The jelly does not adhere to the embryos and can be picked off after removal of the shell. The long narrow yolk sac is attached almost to the anal opening. The embryos are very active and undergo numerous winding and bending movements of the tail which make them difficult to observe under the microscope.

Dates at which fresh-water fish eggs may be obtained and kept in the laboratory:

[2] R. H. Carr, SCIENCE, 69: 407–8, 1929.
[1] F. J. Brinley and C. W. Creaser, SCIENCE, 74: 295–296, 1931.
[3] R. H. Carr, SCIENCE, 83: 355–6, 1936.
[2] S. A. Forbes and R. E. Richardson, Natural History Survey, 1908.

March and April: Yellow perch (1); wall-eyed pike; common pike. *May and June:* European carp.

June and July: Log-perch (1); straw-colored minnow (1); common shiner (1). *October to April:* Trout and salmon.

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ACETO-CARMIN MOUNTING MEDIA

BELLING'S aceto-carmin technique,[1,2] which has been so valuable for a quick examination of meiotic divisions, has proven to be especially useful in the investigation of the giant chromosomes in the salivary glands of the Diptera. The chief disadvantage of the method lies in the fact that the preparations are temporary and the specimens can not be preserved without further treatment. Often specimens so prepared are too valuable to be discarded and a number of methods have been devised for transforming these temporary preparations into permanent slides. (McClintock,[3] Steere,[4] Buck,[5] Marshak,[6] etc.). These methods serve the purpose for which they were designed, but they lose the chief advantage of Belling's original technique, its extreme simplicity and speed.

The aceto-carmin technique can be greatly improved and the preparations made permanent by adding to the fixing solution certain inert substances which do not alter the fixation image but which serve as mounting media when the acetic acid and water evaporate. A number of such substances are available, *i.e.*, dextrose, gelatin, glycerine, gum-arabic, pectin, etc. A detailed investigation of these water-soluble mounting media is now in progress. Two mixtures, however, have already shown their usefulness.

(1) The specimen is macerated on a slide in a drop of Belling's aceto-carmin (a saturated solution of carmin in 45 per cent. acetic acid plus a trace of iron). Then several drops of the following solution are added:

Belling's aceto-carmin	80 cc
Karo Corn Syrup (Dextrose)	10 cc
Certo (Pectin)	10 cc

(The commercial products in the mixture can be purchased at any grocery store.) The preparation is then heated, as in the Belling technique. The coverglass can be pressed down until the specimen has reached the desired thinness. If an excess of the solution is squeezed out around the edges of the coverglass it need not be removed, as it forms an excellent sizing and dries as hard as balsam.

(2) The following mixture may be used alone and thus it reduces the fixing, staining and mounting to a single operation. It may be used undiluted or it may be diluted with Belling's aceto-carmin in various proportions (3:1, 1:1, 1:3, etc.), depending upon the nature of the specimen to be examined. With greater dilutions more fluid should be used to allow for the greater evaporation of water and acetic acid.

Acetic acid (glacial)	50 cc
Water	50 cc
Glycerine	1 cc
Gelatin (powdered)	10 grams
Dextrose	4 grams
$FeCl_3$	0.05 grams
Carmin	To saturation

The gelatin should be dissolved in the water and the other components added. The mixture should be boiled and filtered, just as is done with Belling's solution. As the acid and water evaporate, the medium becomes as firm as balsam and, unlike the familiar glycerine-jelly, it will not liquefy, even when heated to 80° C.

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[1] *Amer. Nat.*, 55: 533, 1921.
[2] *Biol. Bul.*, 50: 160, 1926.
[3] *Stain Tech.*, 4: 53, 1929.
[4] *Stain Tech.*, 6: 107, 1931.
[5] SCIENCE, 81: 75, 1935.
[6] *Amer. Nat.*, 70: 406, 1936.

BOOKS RECEIVED

BRAGG, W. L. *Atomic Structure of Minerals.* The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University. Pp. xiii + 292. 144 figures. Cornell University Press. $3.75.

Bulletin of the National Research Council, No. 99; Mineral Nutrition of Farm Animals. H. H. MITCHELL and F. J. MCCLURE. Pp. 135. National Research Council. $1.00.

COCKERELL, T. D. A. *African Bees of the Genera Ceratina, Halictus and Megachile.* Pp. xvi + 254. 48 figures. British Museum, London.

CROXTON, W. C. *Science in the Elementary School, Including an Activity Program.* Pp. xii + 454. McGraw-Hill. $3.00.

HERZBERG, GERHARD. *Atomic Spectra and Atomic Structure.* Translated from the German by J. W. T. SPINKS. Pp. xiv + 257. 80 figures. Prentice-Hall. $4.25.

Memoirs of the American Philosophical Society. Vol. VIII, Part II, 1937. *Recollections of My Life.* SANTIAGO RAMON Y CAJAL. Translated from the Spanish by E. HORNE CRAIGIE. Pp. 275–638. 80 figures. The Society, Philadelphia.

MORRISON, A. CRESSY. *Man in a Chemical World.* Pp. xi + 292. Illustrated. Scribner's. $3.00.

NEWMAN, HORATIO H., FRANK N. FREEMAN and KARL J. HOLZINGER. *Twins; a Study of Heredity and Environment.* Pp. xvi + 369. 39 plates. 33 figures. University of Chicago Press. $4.00.

PIERCE, W. C. and E. L. HAENISCH. *Quantitative Analysis.* Pp. xi + 412. 28 figures. Wiley. $3.00.

TALBOT, G. *A Monograph of the Pierine Genus Delias.* Part VI. Pp. v + 388. 71 plates. British Museum. £1, 5s.

Tumori. Instituto Nazionale Vittorio Emanuele III Per Lo Studio E La Cura Dei Tumori. Anno XXIII, Serie II, Vol. XI, Fascicolo I. Pp. 188. 13 plates. Industrie Grafiche Italiane Stucchi, Milano.

Woods Hole Oceanographic Institution, Collected Reprints, 1936. 128 contributions. The Institution, Woods Hole, Mass.